Amendments to the Claims

1. A driver, comprising:

a battery terminal ~~(18)~~ and a ground terminal ~~(14)~~ for connection to a voltage battery output and a ground battery output, respectively;

an output terminal ~~(16)~~ for driving a coil ~~(92)~~;

an energise FET ~~(4)~~ having a source ~~(42)~~, a gate ~~(48)~~ and a drain ~~(46)~~;

a control FET ~~(6)~~ having a source ~~(62)~~, a gate ~~(68)~~ and a drain ~~(66)~~; and

a freewheel FET ~~(8)~~ having a source ~~(82)~~, a gate ~~(88)~~ and a drain ~~(86)~~,

wherein the energise FET is connected with source and drain between the output terminal ~~(16)~~ and the ground terminal ~~(14)~~, and the control FET ~~(6)~~ and freewheel FET ~~(8)~~ are connected in series between the battery terminal ~~(18)~~ and the output terminal ~~(16)~~, the sources and drains ~~(62,66,82,86)~~ of the control and freewheel FETs ~~(6,8)~~ being arranged reversely so that current flowing through the control and freewheel FETs ~~(6,8)~~ in series flows from source to drain in one of the control and freewheel FETs ~~(6,8)~~ and from drain to source in the other.

2. A driver according to claim 1, wherein the source ~~(42)~~ of the energise FET ~~(4)~~ is connected to the ground terminal ~~(14)~~ and the drain ~~(46)~~ is connected to the output terminal ~~(16)~~;

the drain ~~(66)~~ of the control FET ~~(6)~~ is connected in common with the drain ~~(46)~~ of the energise FET ~~(4)~~ to the output terminal ~~(16)~~; and

the drain ~~(86)~~ of the freewheel FET ~~(8)~~ is connected to the battery terminal ~~(18)~~ and the source ~~(82)~~ is connected to the source ~~(62)~~ of the control FET ~~(6)~~.

3. A driver according to ~~claim 1 or 2~~claim 1 comprising a common semiconductor substrate ~~(3)~~, wherein the drains ~~(46, 66)~~ of the control FET ~~(6)~~ and the energise FET ~~(4)~~ are formed in the common semiconductor substrate and the drain ~~(86)~~ of the freewheel FET ~~(8)~~ is isolated from the common semiconductor substrate.

4. A driver according to claim 3 further comprising control circuitry ~~(10)~~ integrally formed in the common semiconductor substrate ~~(3)~~, the control circuitry

~~(10)~~ having a high voltage power rail ~~(52)~~ connected to the battery terminal ~~(18)~~ and a low voltage power rail ~~(54)~~ connected to the ground terminal ~~(14)~~ for powering the control circuitry from the battery and ground terminals.

5. A driver according to claim 4 wherein the control circuitry includes:

high-side control circuitry ~~(58)~~ integrated in the common semiconductor substrate and connected to the gates ~~(68, 88)~~ of the control and freewheel FETs ~~(6, 8)~~ to control the FETs; and

low-side control circuitry ~~(56)~~ integrated in the common semiconductor substrate and connected to the gate ~~(48)~~ of the energise FET ~~(4)~~ to control the energise FET.

6. A driver according to ~~claims 4 or 5~~claim 4, wherein the control FET ~~(6)~~ is arranged to have a higher gate capacitance than the freewheel FET ~~(8)~~, and the control circuitry is arranged to turn the control FET ~~(6)~~ fully on in the energise mode and, on switching from the energise mode to the freewheel mode, to connect the gates of the freewheel FET ~~(8)~~ and the control FET ~~(6)~~ together.

7. A driver according to ~~any of claims 4 to 6~~ claim 4 wherein the control circuitry ~~(10)~~ further comprises temperature and voltage overload protection ~~(59)~~ for protecting one or more of the energise FET, the control FET and the freewheel FET.

8. A driver according to ~~any of claims 4 to 7~~ claim 4 wherein the control circuitry is arranged to switch the FETs between an energise mode in which the energise FET is on and the freewheel FET is off, a freewheel mode in which the energise FET is *off* and both the control and freewheel FETs are *off* and a ring-off mode in which the energise FET is *off* and the control FET is *off*.

9. A driver according to ~~any of claims 3 to 8~~ claim 3 wherein the freewheel FET ~~(8)~~ is a discrete FET formed in a separate semiconductor substrate.

10. A driver, comprising:

a battery terminal ~~(18)~~ and a ground terminal ~~(14)~~ for connection to a voltage battery output and a ground battery output, respectively;

an output terminal ~~(16)~~ for driving a coil;

high and low side driver FETs ~~(4, 6)~~ integrated in a common substrate ~~(3)~~ and connected between the battery terminal ~~(18)~~ and the output terminal ~~(16)~~ and the ground terminal ~~(14)~~ and the output terminal ~~(16)~~, respectively;

high-side control circuitry ~~(58)~~ capable of operation when the voltage on the common substrate is at least 1V above the voltage on the ground terminal integrated in the common semiconductor substrate, the high-side control circuitry being connected to the gates of the high side driver FET or FETs to control the high side driver FET or FETs; and

low-side control circuitry ~~(56)~~ capable of operation even when the

voltage on the common substrate is close to the voltage on the ground terminal integrated in the common semiconductor substrate, the low-side control circuitry being connected to the gates of the low side driver FET or FETs to control the low side driver FET or FETs.

11. A driver according to any preceding claim wherein the FETs ~~(4,6)~~ are each n-type.

12. A coil control circuit, comprising:

a driver ~~(2)~~ according to any preceding claim;

a battery ~~(90)~~ having a voltage battery output connected to the battery

terminal ~~(18)~~ of the driver and a ground battery output connected to the ground terminal ~~(14)~~ of the driver; and

a coil ~~(92)~~ connected between the output terminal ~~(16)~~ of the driver and the voltage battery output.

13. A coil control circuit according to claim 12 wherein the coil ~~(92)~~ is a solenoid actuator having a mechanical actuator actuated by current in the coil.

14. A method of operation of a coil control circuit, comprising:

providing a coil control circuit having a coil ~~(92)~~, a battery ~~(90)~~ having positive and negative outputs, and a driver ~~(2)~~, the driver having an output terminal ~~(16)~~ connected through the coil ~~(92)~~ to a first one of the battery outputs, an energise FET ~~(4)~~ connected between the output terminal ~~(16)~~ and the other one of the battery

outputs; and control ~~(6)~~ and freewheel ~~(8)~~ FETs of the like conductivity type connected reversely in series between the output terminal and the first one of the battery output;

switching to an energise mode in which the energise FET ~~(4)~~ is on and the freewheel FET ~~(8)~~ is *off* to energise the coil;

switching to a freewheel mode in which the energise FET ~~(4)~~ is *off* and both the control ~~(6)~~ and freewheel ~~(8)~~ FETs are on to retain the coil energised; and

switching to a ring-off mode in which the energise FET ~~(4)~~ is *off* and the control FET ~~(6)~~ is *off* to de-energise the coil.

15. A method according to claim .14 further including switching the control FET ~~(6)~~ fully on in the energise mode and, on switching to the freewheel mode from the energise mode, connecting the gates of the freewheel ~~(8)~~ and control ~~(6)~~ FETs together to share charge to switch on the freewheel FET ~~(8)~~.